**Draft Draft**

**BP Whiting Refinery Pre-Public Notice Draft Permit (IN0000108)**

EPA has reviewed the pre-public notice draft permit for BP Whiting Refinery (IN0000108). IDEM has the following responses to those comments and questions:

**Part I.A.1 Discharge Limitations Outfall 005 Table**

·**Phosphorus' new loading limits:**

Is there any reason the flow rate used to calculate the above loading limit was based upon 2007 data (21.4 MGD), not based upon the most recent data?

**Response:** Since the effluent limits for Phosphorus are technology based and not water quality based effluent limits, there is not a requirement to include mass limits in the permit. Therefore, IDEM proposes to remove the mass limits for Phosphorus from the permit. (See page 2 of the permit)

·**Phenolics' sampling type:**

40 CFR 122.21(g)(7) - Effluent Characteristics indicates that ".....Grab samples must be used for pH, temperature, cyanide, total phenols, residual chlorine, oil and grease, fecal coliform and .....". What is your basis for using 24 hour composite sample for phenolics?

**Response:** The sample type for phenolics has been changed to grab. (See page 2 of the permit)

·**Hexavalent Chromium's sampling type – footnote [4]**:

The Discharge Limitation Table and footnote [4] states that the Hexavalent Chromium sample type shall be grab method. The maximum holding time for a Hexavalent Chromium sample is 24 hours (40 CFR 136.6 Table IB). We are not aware of any such table at 40 CFR 136.6. 40 CFR Part 122.21(g)(7)(i) – Effluent Characteristics; Indicates that sampling for Hexavalent Chromium should be 24-Hr Composite. Please explain your basis for requiring a grab sample rather than 24-Hr Composite.

**Response:** This comment prompted a change in the standard permit language for Hex Chrome sampling because IDEM was not aware that the holding time for Hex Chrome had been increased from 24 hours to 28 days. Therefore, the BP permit and the permit template have been modified to remove the language regarding the 24 hour holding time and the sample type is now a 24 hour composite. (See page 2 of the permit)

·**Sulfide's sampling type:**

Similar issue as above. As we have discussed with Steve Roush, the existing sampling "composite" type should be retained in the permit for sulfide.

**Response:** The sample type for Sulfide has been changed to 24 hour composite

**·Vanadium's WQBELs loading limits:**

As we discussed with Steve Roush, the existing effluent limits should be retained in the permit because BP has demonstrated that it is now able to consistently meet the existing limits for Total Vanadium.

**Response:** The effluent limits for Vanadium are being retained in the permit with the following reopener clause: "When the Sulfur Recovery Unit (SRU) Beavon Stretford Solution blowdown (vanadium-based technology) is replaced with non-vanadium based Shell Claus Off-gas Treatment (SCOT), the permittee may request, in writing, a review of the effluent limits and monitoring requirement for Total Vanadium at Outfall 005." (See page 3 of the permit)

**Part I.B.1 Narrative Water Quality Standards**:

Under 327 IAC 2-1.5-8, the surface water quality conditions shall meet a listing of minimum standards. Specifically, 327 IAC 2-1.5-8(b)(1) states, "All surface water at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to the discharges ***that do any of the following***:(emphasis added) …"

**Response:** The phrase "that do any of the following" has been added to the end of the opening paragraph in Part I.B.I on page 8 of the permit.

**Renewal mercury SMV:**

·Mercury SMV renewal should be reviewed based upon 327 IAC 5-3.5-7, such as but not limited to, reviewing the SMV report submitted by BP as requested by the existing permit Part I, 327 IAC 5-3.5-7(a)(2), (b) and (c), to ensure the existing PMPP permit requirements are adequate means for ensuring continued mercury reductions.

**Response:** The SMV report submitted by BP has been reviewed to ensure that the existing PMPP requirements are adequate for ensuring continued mercury reductions

**Part I.G Whole Effluent Toxicity Test:**

·Part I.G.1.e, is there any reason the Daphnid (Ceriodaphnia dubia) test species is omitted from reporting requirements?

**Response:** Ceriodaphnia dubia has been re-included in Part I.G.1 on page 28 of the permit.

· Part I.G.1.f, remove paragraph (1) and (3) since diffuser construction has been completed. Also, is there any reason the Daphnid (Ceriodaphnia dubia) test species is omitted from Demonstration of Toxicity requirements?

**Response:** Ceriodaphnia dubia has been re-included in Part I.G.1.f on pages 30 and 31 of the permit.

**Part II.B.3 Management Requirements:**

·Under 40 CFR 122.41(n),the affirmative defense of "upset" is only available where the permittee can demonstrate that the conditions specified at 40 CFR 122.41(n)(3) are met. One of those conditions is that the permittee must demonstrate that "[a]n upset occurred and that the permittee can identify the cause(s) of the upset." 40 CFR 122.41(n)(3)(i). Thus, the upset defense is not available in situations where the permittee is unable to identify the cause(s) of the upset.

The upset provisions in Section II.B.3 of the BP Whiting permit appear to be inconsistent with this federal requirement. Specifically, Section II.B.3.c(1) provides that the permittee must demonstrate, among other thing, that "[a]n upset occurred and the permittee has identified the specific cause(s) of the upset, ***if possible***" (emphasis added). Thus, it appears that a permittee could establish the upset defense under the BP Whiting permit provisions without identifying the cause(s) of the upset. This problem could be remedied by deleting the phrase "if possible."

**Response:** The phrase "if possible" has been removed from part II.B.3.c (1) on page 41 of the permit.

Also, the **burden of proof** provisions are missing in the BP Whiting permit as stated in 40 CFR 122.41(n)(4), "In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof."

**Response:** Part II.B.2.d on page 41 of the permit now reads as follows: "In accordance with 40 CFR 122.41(n)(4), In any enforcement proceedings the permittee seeking to establish the occurrence of an upset has the burden of proof."

**Misc.:**

·Cover page, remove "IV", there is no Part IV existing in the draft permit.

**Response:** Part IV of the permit contains the Streamlined Mercury Variance requirements beginning on page 47 of the permit.

·Are there any reasons IDEM kept the following existing permit language? If not, the following wording should be removed from the draft permit since diffuser has been operated: "During the period beginning on the effective date of this permit and lasting until the Alternate Mixing Zone is operational or ...., whichever occurs first,…."

**Response:** Any reference to the permit becoming effective beginning when the alternate mixing zone is operational has been removed from the permit.

·The permit should include the following provision: "The permittee receives wastes from certain offsite facilities identified in the permittee's permit application. The Reporting Requirements section of this permit includes a variety of requirements for the permittee to notify IDEM of alterations, additions or other changes to the facility or facility operations and activities. The Reporting Requirements in this permit shall be construed to also include alterations, additions or other changes to the offsite facilities and facility operations."

**Response:** The last paragraph of Part II.A.4 on page 37 of the permit has been modified to read as follows:

The permittee shall submit any information that the permittee knows or has reason to believe would constitute cause for modification or revocation and reissuance of the permit at the earliest time such information becomes available, such as plans for physical alterations or additions to the permitted facility and Ineos and NiSource Whiting Clean Energy that:

(1) could significantly change the nature of, or increase the quantity of, pollutants discharged; or

(2) the commissioner may request to evaluate whether such cause exists.

**Stormwater overflow from WWTP:**

BP captures and treats most of its contaminated stormwater in its WWTP then discharges it through outfall 005. To increase the amount of stormwater that is captured and sent to the WWTP, BP built a new stormwater equalization tank (alternative storage) with a capacity around 11.6 million gallons. We have a number of questions regarding the equalization tank.

·What was the design basis for determining the size of the above new stormwater equalization tank, (25 year stormwater event? 100 year stormwater event…)?

Response: ???????

·Under what circumstances might it be necessary for BP to discharge flows from the equalization tank without sending those flows to the WWTP?

Response: ??????

·How frequently has BP discharged flows from the equalization tank without sending those flows through the WWTP, and what were the volumes of those discharges?

Response; ??????

·Is the equalization tank used for process water and, if so, is process water ever discharged from the tank without first going through the WWTP?

Response: NO

·What is the effluent quality of the discharges from the equalization tank that do not go through the WWTP?

Response: ????????

**Part I.D and E Stormwater**

·Part I.D.9.a Inspections

The third paragraph of this provision refers to the Comprehensive Site Compliance Evaluation and should be moved to Part I.D.9.b and labeled as Part I.D.9.b(2).

**Response:** The Comprehensive Site Compliance Evaluation is now found in Part I.D.9.c on page 22 of the permit.

·Part I.D.9.b Inspections

Re-number Parts I.D.9.b(2) and (3) as Parts I.D.9.b(3) and (4).

**Response:** These changes have been made on pages 22 and 23 of the permit.

·Part I.E.2.b(4) and (5)

Both of these provisions should refer to subdivisions 2.b.(2)(J) through (T).

**Response:** These changes have been made on pages 26 and 27 of the permit.

**Fact Sheet Discussion of Bypass of Diffuser**:

The permit fact sheet discusses the possibility that BP might need to discharge from outfall 001 when it performs maintenance of the diffuser. We recommend that the permit include the following provision:

> *Discharges from Outfall 001 are prohibited by this permit.* The permittee shall provide at least 10-day advance written notice to IDEM if it anticipates the need to discharge from Outfall 001 *due the need* to perform emergency repairs or replacements to the diffuser system.

We also recommend that the Fact Sheet provisions pertaining to this be revised as follows:

~~Bypass of~~ **Emergency Repairs or Replacements of** the Diffuser

~~BP does not anticipate the need to utilize a routine bypass of the diffuser (Outfall 005).~~ The sump and pump system for the discharge of effluent through the diffuser has been engineered to allow the performance of any routine maintenance for the sluice gates without having to bypass the diffuser Outfall 005. Adequate pumping and design capacities have been included in the engineering scope of work to minimize/eliminate any diffuser bypass due to pump maintenance activities. In addition, annual routine inspections of the diffuser pipeline and diffuser header

(including ports and risers) will be conducted to ascertain any anomalies and/or damage while the diffuser is in operation ~~(i.e., no bypass is necessary for inspection)~~. However, there may be occasion where results of the inspection indicate ~~a bypass is needed for~~ emergency repairs or replacement of damaged parts of the diffuser, pumping system, or pipeline operating system **are necessary**. If such an emergency occurs**, it may be necessary for BP to discharge** ~~and a short term bypass is needed,~~ treated process wastewater flows ~~will be routed back to~~ **through BP's** ~~their present (~~pre-diffuser~~)~~ discharge location at the shoreline of Lake Michigan via Outfall 001. **The permit prohibits discharges from Outfall 001. The permit also requires that, in the event BP anticipates the need for making emergency repairs or replacements to the diffuser that might necessitate the use of Outfall 001,** BP will notify IDEM ~~when the bypass is about to occur,~~ no later than 10 days prior to the **date that it plans to make the repairs or replacements. IDEM will evaluate the notice and determine what action, if any, should be taken by IDEM in the exercise of enforcement discretion, and/or by BP, with regard to the planned, prohibited discharge from Outfall 001. .** ~~bypass, if possible. BP will provide a report to IDEM after the discharge is once again sent through the diffuser Outfall 005 which describes the length of the bypass and any adverse impacts observed during the bypass. BP will do everything feasibly possible to try to perform any repairs and replacements while the diffuser remains in operation, however it is possible that some repairs and replacements will warrant a bypass of the effluent flow from the diffuser Outfall 005 to Outfall 001.~~

**Response:** The following language has been included on pages 35 and 36 of the Fact Sheet regarding the discharge from Outfall 001 and the following effluent limits for Outfall 001 have been placed in the permit are applicable when BP is authorized to discharge from Outfall 001:

Emergency Repairs or Replacements of the Diffuser

The sump and pump system for the discharge of effluent through the diffuser has been engineered to allow the performance of any routine maintenance for the sluice gates without having to bypass the diffuser Outfall 005. Adequate pumping and design capacities have been included in the engineering scope of work to minimize/eliminate any diffuser bypass due to pump maintenance activities. In addition, annual routine inspections of the diffuser pipeline and diffuser header (including ports and risers) will be conducted to ascertain any anomalies and/or damage while the diffuser is in operation.

However, there may be occasion where results of the inspection indicate a bypass is needed for emergency repairs or replacement of damaged parts of the diffuser, pumping system, or pipeline operating system are necessary. If such an emergency occurs, it may be necessary for BP to discharge and a short term bypass is needed, treated process wastewater flows will be routed back to through BP's their present (pre-diffuser) discharge location at the shoreline of Lake Michigan via Outfall 001. The permit prohibits discharges from Outfall 001 unless it has been deemed necessary by IDEM in accordance with the pre-discharge notification requirements. The permit requires that, in the event BP anticipates the need for making emergency repairs or replacements to the diffuser that might necessitate the use of Outfall 001, BP will notify IDEM when the bypass is about to occur, no later than 10 days prior to the date that it plans to make the repairs or replacements. IDEM will evaluate the notice and determine what action, if any, should

be taken by IDEM in the exercise of enforcement discretion, and/or by BP, with regard to the planned, prohibited discharge from Outfall 001.

When BP is authorized to discharge from Outfall 001 for repair or replacement of the diffuser, the discharge must meet the following effluent limitations:

DISCHARGE LIMITATIONS OUTFALL 001
Table 001-1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring | Requirements |
|---|---|---|---|---|---|---|---|---|
| | Monthly | Daily | | Monthly | Daily | | Measurement | Sample |
| Parameter | Average | Maximum | Units | Average | Maximum | Units | Frequency | Type |
| **Flow** | Report | Report | MGD | ---- | ---- | ---- | Daily | 24-Hr. Total |
| **$TBOD_5$** | 4,161 | 8,164 | lbs/day | Report | Report | mg/l | 1 x Weekly | 24 Hr. Comp. |
| **TSS** | 3,646 | 5,694 | lbs/day | Report | Report | mg/l | 2 x Weekly | 24 Hr. Comp. |
| **COD** | 30,323 | 58,427 | lbs/day | Report | Report | mg/l | 1 x Weekly | 24 Hr. Comp. |
| **Oil and Grease** | 1,368 | 2,600 | lbs/day | Report | Report | mg/l | 1 x Weekly | Grab |
| **Phosphorus** | Report | Report | lbs/day | 1.0 | Report | mg/l | 1 x Weekly | 24 Hr. Comp. |
| **Phenolics (4AAP)** | 20.33 | 73.01 | lbs/day | Report | Report | mg/l | 1 x Weekly | Grab |
| **Ammonia as N** | 1,030 | 2,060 | lbs/day | Report | Report | mg/l | 5 x Weekly | 24 Hr. Comp. |
| **Sulfide** | 23.1 | 51.4 | lbs/day | Report | Report | mg/l | 1 x Weekly | 24 Hr. Comp. |
| **Total Chromium** | 23.9 | 68.53 | lbs/day | Report | Report | mg/l | 1 x Weekly | 24 Hr. Comp. |
| **Hex. Chromium** | 2.01 | 4.48 | lbs/day | Report | Report | mg/l | 1 x Weekly | 24-Hr. Comp. |
| **Vanadium** | 50 | 100 | lbs/day | 0.28 | 0.56 | mg/l | 1 x Monthly | 24-Hr. Comp. |
| **Mercury** | | | | | | | | |
| **Final Limits** | 0.00023 | 0.00057 | lbs/day | 1.3 | 3.2 | ng/l | 6 x Yearly | Grab |
| **Interim Variance Limits** | | Annual Average = 23.1 | | | Report | ng/l | 6 x Yearly | Grab |

Table 001-2

| | Quality or Concentration | | | Monitoring | Requirements |
|---|---|---|---|---|---|
| | Daily | Daily | | Measurement | Sample |
| Parameter | Minimum | Maximum | Units | Frequency | Type |
| pH | 6.0 | 9.0 | s.u. | 3 x Weekly | Grab |

**Comments regarding 316(a) demonstration**

1) The demonstration should include the thermal plume study conducted in 2010 as the hydrology and assumptions in that study are critical to understanding the extent of the plume as modeled and the impact on the RIS. It can be incorporated as an appendix, but the demonstration should utilize more of the information in its findings. Of interest specifically would be the modeled plumes during the entire year rather than just when biological sampling occurred. It is also not clear from the demonstration what parameters were used to define the worst case scenario referenced when describing the impacts to the RIS.

Additionally, the limited figures that were provided were in black and white and it was difficult to distinguish the isotherms indicated on the map. EPA requests that a copy of the 2010 thermal plume study be provided for review.

2) From the application forms, outfall 005 discharges at temperatures similar to outfall 002 yet it is not clear that the impact of this discharge was assessed in the demonstration. EPA would agree that the dilution factor applied to this outfall would not indicate reasonable potential to exceed standards for this outfall alone, but for the 316(a) demonstration, it must be considered as it contributes a thermal load within the study area that could affect the thermal plume and the model may be inaccurate.

3) The demonstration provided to EPA did not contain any of the figures 2-x that included the maps showing the areas where biological sampling occurred. EPA requests that these figures be provided for review. From the descriptions of the areas in the demonstration, EPA has concerns that biological sampling was not conducted within the 1000 ft arc that delineates the standard mixing zone under Indiana regulations. Sampling within the mixing zone is important as it ensures that a complete picture of the distribution of species within the study area is obtained.

4) The demonstration indicated that the biological indices excluded non-native species including alewife, salmonids and white perch. For the salmonids and alewife at least, these species represent a critical species of the biological community in Lake Michigan. While they are non-native species, EPA questions whether it was appropriate to exclude them from the indices given their role in the trophic structure.

5) The biological sampling indicated that some species have become more abundant and that a revision to the RIS may be necessary to ensure that the appropriate species are being assessed. Specifically, sand shiner was 3 times as abundant as the spot tail shiner that is part of the RIS.

6) The permit documents also indicate that biological surveys have been conducted in the area of the diffuser to assess any impacts to the biological community. EPA would recommend that these be discussed in the 316(a) demonstration as they represent an assessment of the biological community within the study area.

**Comments on the CWIS documents**

EPA recognizes that IDEM has not yet provided their BTA determination for the facility, but is making comments on the informational documents provided by the facility to raise issues identified during the review.

1) The facility appropriately assesses velocity at the offshore intake structures and provides detailed descriptions of this portion of the cooling water system. However, limited or no information was provided for other components of the CWIS that should be considered in assessing whether the requirements of 316(b) have been met. Specifically, further information should be provided on the pump houses and any screens or fish returns from

those components of the CWIS. The use of cooling towers and the cooling water reductions associated with those towers from a once through configuration should also be provided.

2) The facility should report the monthly or maximum flow through the CWIS, not just an annual average for determining the BTA for 316(b) purposes if they wish to consider that flow for 316(b) consideration in place of the maximum design flow of the CWIS. Additionally, they indicate that the velocities were measured at a high of 35 psig yet do not associate that pressure with a flow for comparison to the maximum design flow of the CWIS. EPA recognizes that the facility has made reductions in water usage since the CWIS was put in place and 316(b) can consider those lower actual flows. However, the permit should then limit the facility to flows at that level of withdrawal rather than unlimited operation of the CWIS.

**Response:** The following CWIS evaluation is on pages 41 through 47 of the Fact Sheet:

Section 316(b) Cooling Water Intake Structure (CWIS) Requirements

Introduction

The U.S. Environmental Protection Agency (EPA) requires the permit issuing authority to conduct a best professional judgment (BPJ) evaluation of the CWIS to establish that the CWIS is equivalent to the best technology available (BTA). Therefore, the BP Whiting Business Unit (WBU) provided IDEM a description of the CWIS dated 29 August 2012.

Cooling Water Intake Structures Descriptions

Lake Michigan is the water source for both water stations. At the present time, there are two water intakes located approximately 1,330 and 1,440 feet offshore, about 300 feet apart. Although grating exists on the intake system to exclude large debris, no intake screen system exists.

One water intake supplies water to the 1911 tunnel; the other intake supplies water to the 1942 tunnel. These tunnels are tied together near the water stations, so that both tunnels serve both water stations. Although each water station can be isolated for maintenance, the current configuration does not allow either tunnel intake to be isolated. The tunnels terminate in the suction well located below the floor of each station. All pumps in each station take suction from the station well.

1911 Tunnel and Cooling Water Intake Structure

In 1911 a brick tunnel was constructed into Lake Michigan and connected to the "old" pumping station. The inside dimensions of the brick tunnel are 5 feet 0 inches wide by 5 feet 6 inches high; while the wall thickness data is not known. The length of this tunnel is 2,400 feet from the lake intake to the land shaft located adjacent to the tunnel flush tank. (A land shaft is used during the construction of a tunnel.) This tunnel is still in operation and is connected to the tunnel constructed in 1942 and to the two water stations.

Details of the water intake structure to the 1911 tunnel are not as clear. The intake was originally designed with what appear to be three arms capped with cylindrical screens which fed into a central pipe 8 feet 4 inches in diameter. Over time, modifications have been made to maintain the intake structure in operable condition, but much of the original structure remains intact. One of the screened arms is no longer present and the central pipe is now an open pipe receiving vertical water flow. This intake provides a small proportion of the total design intake flow and is located approximately 1,330 feet offshore.

1929 Flume

The No. 1 Water Station was constructed in 1929. A reinforced concrete tunnel, sometimes called a "flume", also was constructed to connect the land shaft of the 1911 tunnel with the suction well of the No. 1 Water Station. There is a gate well and a sluice gate (manual or electric motor operated) inside No. 1 Water Station to block off the water supply for necessary repairs inside the suction well of No. 1Water Station. This will not bypass the 1911 intake as flow will continue to No. 2 Water Station.

1942 Tunnel and Intake

The No.2 Water Station was constructed in 1942. Also constructed at this time was a second tunnel into the lake. The length of this tunnel is 2530 feet from its water intake to the 10 feet 0 inch inner diameter reinforced concrete land shaft located northwest of No. 1 Water Station. A gate well (but no sluice gate) is located in this tunnel section. There is a gate well and manually operated sluice gates to block off this tunnel for necessary repairs inside the suction well of No. 2 Water Station.

In the early 1980s, a frazzle ice and biological fouling prevention system was put in place. Hot water and chlorine solution are pumped out to manifolds running the circumference of the intake in order to reduce ice and biological growth. This intake provides the majority of the total design intake flow and is located approximately 1,440 feet offshore.

WATER STATION DESCRIPTION AND OPERATION

Water Station Nos. 1 and 2 receive water via both intake tunnels to a wet well located under each water station. All pumps in each station take suction from the station well. No. 1 Water Station houses five pumps (including one smaller firewater pump) with a design capacity of 117.8 million gallons per day (MGD). One pump was removed, but equipment is still in place for it to be re-installed to satisfy future needs. No.2 Water Station houses four pumps with a design capacity of 146.3 MGD. A recent upgrade to the firewater system included a new pump house for three firewater pumps with a design capacity of 17.3 MGD. This pump house's suction well is tied into the land shaft. The four firewater pumps in No. 1 Water Station and the new firewater pump house operate on demand and are not often in use. The capacity of all three pump houses combined is 281.4 MGD

Pumps are generally operated by maintaining a pressure of approximately 34 to 35 psig in the main header and the number and combination of pumps turned on at a given time depends on refinery water demand. Therefore, the actual flow at individual pumps or water stations is variable. Flow meters are located at the Lakefront Waste Water Treatment Plant to measure discharge to the lake. Water intake values are, therefore, back-calculated, incorporating losses incurred within the refinery. The calculated total average intake flow from 2009 to 2011 was 91.9 MGD. A theoretical analysis of intake tunnel volumes and frictional impacts estimated that 67 percent of the total water intake flows through the 1942 tunnel and 33 percent through the 1911 tunnel. Estimated flows for the 1942 and 1911 tunnels based on this percentage split are shown in Table 1:

TABLE 1
AVERAGE ACTUAL INTAKE FLOW FROM 2009-2011

| Time Period | Intake 1942 Flow | Intake 1911 Flow | Combined Flow |
|---|---|---|---|
| 2009 | 67.4 | 33.1 | 100.5 |
| 2010 | 61.8 | 30.3 | 92.1 |
| 2011 | 55.9 | 27.4 | 83.3 |
| 2009-2011 | 61.7 | 30.3 | 92.0 |

AVERAGE THROUGH-SCREEN VELOCITY

Average through-screen velocity was measured on November 13, 2009, during a routine intake inspection. Divers used a hand-held velocity meter and positioned it along the intake plane at specified locations, orienting the meter until the greatest velocity at each location was observed. Fifteen locations were measured at the 1942 intake and one measurement was taken at the 1911 intake. Average intake flow on November 13 was calculated at approximately 85 MGD. During the period when the diver was taking velocity measurements, pumps were operated at 35 psig to simulate high refinery water demand and increased intake water velocities. The average velocity observed at the 1942 intake was 0.26 feet per second (fps) with a maximum velocity of 0.35 fps. The single velocity measurement for the 1911 intake was made at the center of the intake pipe and had a value of 0.56 fps. This location is likely the maximum velocity of the intake pipe velocity field and the average velocity would therefore be less than this value.

The number of pumps and design capacities were provided in the 29 August 2012 CWIS Documentation. Water enters each pump house from two offshore intake tunnels to a pump house suction well. Pumps draw water from the well for distribution throughout the refinery as well as supply to other users such as Whiting Clean Energy, Praxair, Ineos Chemical and previously the City of Whiting. The following table No. 1 provides additional information on the intakes:

**Table No. 1. Water Station Information**

| Intake Characteristic | Water Station No. 1 | Water Station No. 2 | Firewater Pump House |
|---|---|---|---|
| **Number of debris/fish screens** | 0 | 0 | 0 |
| **Number of water pumps** | 5 | 4 | 3 |
| **Pump capacity (design)** | 117.8 MGD | 146.3 MGD | 13.0 MGD |
| **Intake supplier** | Both 1942 and 1911 offshore intakes | Both 1942 and 1911 offshore intakes | Both 1942 and 1911 offshore intakes |
| **Supplied Operation** | BP Refinery (process/utility water and once through cooling water, City of Whiting (until 2010), Whiting Clean Energy, Ineos Chemical (until end 2012) and Praxair | BP Refinery (process/utility water and once through cooling water, City of Whiting (until 2010), Whiting Clean Energy, Ineos Chemical (until end 2012) and Praxair | BP Refinery fire water system |

(B) There are no dedicated debris screens or fish returns at the pump houses or intakes. Debris screening is achieved at the individual process unit standard pump screens. When the proposed 316(b) Rule is finalized, BP will assess the new regulation requirements, the current intake configuration, and options to remain compliant and protective of the environment. EPA and IDEM have previously determined, taking into account the current configuration, that the CWIS is protective of the environment in accordance with the current 316 (b) requirements.

(C) There are six cooling towers in operation within the refinery. Installation of two additional cooling towers is included in the Whiting Refinery Modernization Project (WRMP). The cooling towers and unit re-configurations of the plant upgrade project are expected to achieve water demand reductions estimated at 16.9 MGD. Though new circulating systems are being installed and evaluated, replacing the entire system with circulating systems is not practicable. Upon finalization of the 316(b) Rule and completion and startup of WRMP, BP will evaluate water reductions provided by the cooling towers and other process reconfigurations and how those reductions might help the Whiting facility to comply with 316(b) requirements.

(D) The monthly average daily Actual Intake Flow (AIF) is calculated by averaging the daily flows for the days in the month and is provided as a daily average flow rate, summarized below for Years 2009 to 2011, along with the daily design flow.

**Design vs. Actual Intake Flow**

| Month/Year | Monthly Intake Flow (MGD) | |
|---|---|---|
| | Design Intake Flow | Calculated Actual Intake |
| Jan 2009 | 277.1 | 102.3 |
| Feb | | 108.5 |
| Mar | | 105.0 |
| Apr | | 95.7 |
| May | | 95.6 |
| Jun | | 103.2 |
| Jul | | 108.5 |
| Aug | | 107.9 |
| Sep | | 104.7 |
| Oct | | 96.5 |
| Nov | | 89.6 |
| Dec | | 87.7 |
| **2009 Annual** | **--** | **100.5** |
| Jan 2010 | 277.1 | 86.0 |
| Feb | | 83.0 |
| Mar | | 84.0 |
| Apr | | 88.8 |
| May | | 91.1 |
| Jun | | 97.4 |
| Jul | | 104.5 |
| Aug | | 106.1 |
| Sep | | 100.8 |
| Oct | | 93.5 |
| Nov | | 86.3 |
| Dec | | 83.1 |
| **2010 Annual** | **--** | **92.1** |
| Jan 2011 | 277.1 | 72.5 |
| Feb | | 72.0 |
| Mar | | 58.5 |
| Apr | | 65.8 |
| May | | 72.0 |
| Jun | | 93.1 |
| Jul | | 93.6 |
| Aug | | 80.7 |
| Sep | | 114.8 |
| | Monthly Intake Flow (MGD) | |

| Month/Year | Design Intake Flow | Calculated Actual Intake |
|---|---|---|
| Oct | 277.1 | 101.1 |
| Nov | | 86.2 |
| Dec | | 89.1 |
| **2011 Annual** | **--** | **83.3** |

(E) Intake flow is calculated from the discharge of the Lakefront Waste Water Treatment Plant, consumptive use, and water losses that occur within the refinery. Therefore, there is no flow data that can be directly associated with the instantaneous velocity measurements taken at the intake and the 35 psig header pressure. However, as stated in the documentation, the average intake flow calculated for the day of the velocity measurements was 85 MGD.

(F) BP has a water intake and usage registration with the Indiana Department of Natural Resources. BP recognizes that its average cooling water flow needs do not approach DIF conditions. However, until the 316(b) Rule is finalized, BP believes it is premature to commit to any permitted flow reductions at this facility, especially if evaporative losses (consumptive losses) are capped due to the Great Lakes Compact. Monthly calculated intake flows are reported each month and total annual flows are reported to the Indiana Department of Natural Resources (DNR). The DNR is the authority for the state of Indiana responsible for the registration of the intake capacities and allowed withdrawals from the Great Lakes.

Conclusion and Permit Conditions

Based on available information; IDEM has made a Best Technology Available (BTA) determination that the existing cooling water intake structures represent best technology available to minimize adverse environmental impact in accordance with Section 316(b) of the federal Clean Water Act (33 U.S.C. section 1326) at this time based on the following information:

- Average through-screen velocity was measured on November 13, 2009, during a routine intake inspection. The average velocity observed at the 1942 intake was 0.26 feet per second (fps) with a maximum velocity of 0.35 fps. The single velocity measurement for the 1911 intake was made at the center of the intake pipe and had a value of 0.56 fps. This location is likely the maximum velocity of the intake pipe velocity field and the average velocity would therefore be less than this value.
- The capacity of all three pump houses that supply water combined to BP is 281.4 MGD and the 2011 annual average water intake rate is 83.3 MGD. The water intake rate over the past several years is in decline due to improvements and recycling efforts at the refinery: 2009 annual average water intake rate = 100.5 MGD; 2010 annual average water intake rate = 92.1 MGD. The 2011 annual average water intake rate is approximately 30 % of the pumping capacity.
- There are six cooling towers in operation within the refinery. Installation of two additional cooling towers is included in the Whiting Refinery Modernization Project

(WRMP). The cooling towers and unit re-configurations of the plant upgrade project are expected to achieve water demand reductions estimated at 16.9 MGD.

- BP has a water intake and usage registration with the Indiana Department of Natural Resources. Monthly calculated intake flows are reported each month and total annual flows are reported to the Indiana Department of Natural Resources (DNR). The DNR is the authority for the state of Indiana responsible for the registration of the intake capacities and allowed withdrawals from the Great Lakes.
- The DNR is also responsible for the implementation of the Great Lakes Initiative which regulates the amount of withdrawal, consumption and diversions of the Indiana portion of the Great Lakes. Consumptive losses as well as diversions and design withdraw capacities are capped by the DNR registration.

This determination is based on Best Professional Judgment (BPJ) and will be reassessed at the next permit reissuance to ensure that the CWISs continue to meet the requirements of Section 316(b) of the federal Clean Water Act (33 U.S.C. section 1326). IDEM believes that, for reassessment of its BTA determination during the next permit renewal, fish return alternatives must be evaluated during the term of this permit renewal. The permittee shall comply with the following requirements in the renewed permit:

1. At all times properly operate and maintain the cooling water intake structure equipment.

2. The permittee shall submit a fish impingement and mortality minimization alternatives evaluation and implementation plan to IDEM for review and approval. The evaluation report and implementation plan for any operational changes and/or facility modification shall be submitted to IDEM as soon as feasible, but at least 270 days prior to the expiration date of this permit. The fish mortality minimization alternatives evaluation shall include the feasibility of installing a fish return to Lake Michigan.

3. Inform IDEM of any proposed changes to the CWIS or proposed changes to operations at the facility that affect the information taken into account in the current BTA evaluation.

3. Submit all required reports to the IDEM, Office of Water Quality, Permits Branch

**Comments on Permit and Factsheet related to Thermal Limitations**

1) The 2008 Hanlon memorandum regarding 316(a) limitations lays out the federal requirements for permitting authorities when issuing permits containing 316(a) limitations. EPA has provided this memo previously, but would recommend IDEM review the memorandum to ensure that the permit, fact sheet and public notice meet federal requirements. The review of the fact sheet indicates that it does not contain all the information specified in that memorandum.

2) EPA would also recommend that the equation for calculating compliance with the BTU/Hr limitation be incorporated into the permit.

**Response:** The following rationale for continuing the existing 316a alternate thermal effluent limits is contained on pages 38 through 40 of the fact sheet:

Temperature

The NPDES permit for BP contains alternate thermal effluent limits established in accordance with 327 IAC 5-7 and Section 316(a) of the Clean Water Act. The alternate limits of a net daily average of 1.7 million BTU/Hour and a net daily average maximum of 2.0 million BTUs/ Hour were developed as a part of the 316(a) approval given to the previous owner of this facility (Amoco Oil Company) on June 16, 1975 by the U.S. EPA. The net temperature is calculated by subtracting the temperature value of the intake water from the temperature value of the gross discharge every hour and averaging those values over the 24 hours of each day when sampling occurs.

During the term of the existing NPDES permit, BP North America, LLC worked with IDEM to develop and conduct an IDEM approved thermal impact study and then submit the results of that study to IDEM to demonstrate that the alternative effluent limitations (existing alternate limits) desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made.

A Type III §316(a) Demonstration (US Environmental Protection Agency [EPA] 1977) was conducted for the Whiting Refinery (then owned by Amoco Oil Company and Union Carbide Corporation in 1975) (Limnetics 1975). The Limnetics study included plume mapping data collected in 1971-1973 and biological data collected from several power plants in the southern portion of the lake during the same time frame. Limnetics (1975, p. 115) concluded that the thermal effluents from this Refinery "are not expected to appreciably harm the indigenous population of fish, shellfish and associated wildlife." IDEM accepted the demonstration and EPA Region V concurred stating "we have no objections to the State of Indiana granting Amoco's request for alternative thermal effluent limits" (letter from James McDonald, Director, Region V EPA to IDEM dated June 16, 1975).

The current NPDES permit (IN0000108) required that a thermal monitoring/modeling study be conducted, which was completed in 2010 (AECOM 2011). Consistent with a Study Plan approved by IDEM, BP conducted a four-week long field survey in the receiving water near Outfall 002 from September 23 to October 27, 2010.

Results of model scenario runs indicate that the thermal plume extends beyond the 1,000-foot arc encircling the outfall under worst-case scenarios. The proposed future plant conditions with reduced volumes of cooling water discharge are not expected to have any

significant impacts on the extent of the thermal plume. The extent of the thermal plume is greatest when wind is from the north and the ambient current direction is towards the southeast.

Based on the thermal plume study results, a §316(a) variance demonstration based on a site- specific biological assessment was determined to be warranted. Section IIIA of the NPDES Permit requires that BP conduct a §316(a) study to justify continuation of the previously approved temperature variance. As conditioned in the permit, BP prepared a study plan for review and approval by IDEM, conducted the approved study, and, within 24 months of approval of the study plan, submitted this §316(a) variance request to IDEM.

Prior to submittal of the biological study plan, IDEM staff were consulted on several occasions to get their input regarding study design. It was agreed that the study should be conducted primarily during the summer and that fish are the only taxonomic group that need to be monitored. It was further agreed that fish near shore would be sampled by electrofishing and those offshore by trawling and gill netting. On May 27, 2011, BP sent an initial draft of the Study Plan to IDEM for review. On June 10, 2011, IDEM requested a number of changes including taking considerably more physicochemical measurements, requesting additional biological metrics, repositioning of two sampling locations, and adding one more offshore location. On July 5, 2011, BP sent a revised study plan to IDEM that addressed the various concerns that IDEM had raised in its letter dated June 10, 2011. BP modified the draft study plan to address IDEM recommendations and IDEM approved the revised study plan on July 8, 2011.

According to Indiana water temperature criteria for Lake Michigan [327 IAC 2-1.5-8(c)], the receiving water temperature cannot be more than 3°F (1.7°C) greater than existing background temperature at a maximum distance of a 1,000-ft arc inscribed from the thermal discharge. Under Indiana water quality criteria, water within the arc can exceed the standard without a thermal variance under §316(a). In addition, the receiving water temperature outside of the
1,000-ft arc cannot exceed specified monthly temperatures in Lake Michigan (Table 1-2), except when an exceedance can be demonstrated to be caused by the water temperature at the intake.

According to the approved thermal plume study plan, BP conducted a four-week field survey in the receiving water near Outfall 002 from September 23 to October 27, 2010. The Environmental Fluid Dynamics Code (EFDC) model was used to develop the thermal model due to the complex hydrodynamics of the BP Whiting thermal discharge, the resulting plume, and the need to evaluate the thermal plume in three dimensions. The EFDC model was calibrated using the first two weeks of field survey data from September 27, 2010 to October 11, 2010. The calibrated model was then validated using the second two weeks of field survey data from October 11, 2010 to October 25, 2010. Comparison of predicted data and observed data from the validation period indicated that the model calibration was satisfactory based on the United States Environmental Protection Agency technical guidance (USEPA 1990) and professional judgment, and

that the model is suitable for predictions outside of the calibration period and for predictions at multiple locations within the model domain.

The calibrated and validated model was used to predict the extent of the thermal plume under a range of worst-case heat dissipation scenarios. The results of model scenario runs indicated that the thermal plume extends beyond the 1,000-ft arc encircling the outfall under worst-case scenarios. The proposed future plant conditions are not expected to have any significant impacts on the extent of the thermal plume. The extent of the thermal plume is greatest when wind is from the north and ambient currents are towards the southeast.

IDEM has reviewed the results of the Thermal Impact Study and the application for alternate thermal effluent limits in accordance with 327 IAC 5-7 and IDEM proposes to allow BP Products North America to continue using the existing alternate thermal effluent limitations at Outfall 002.